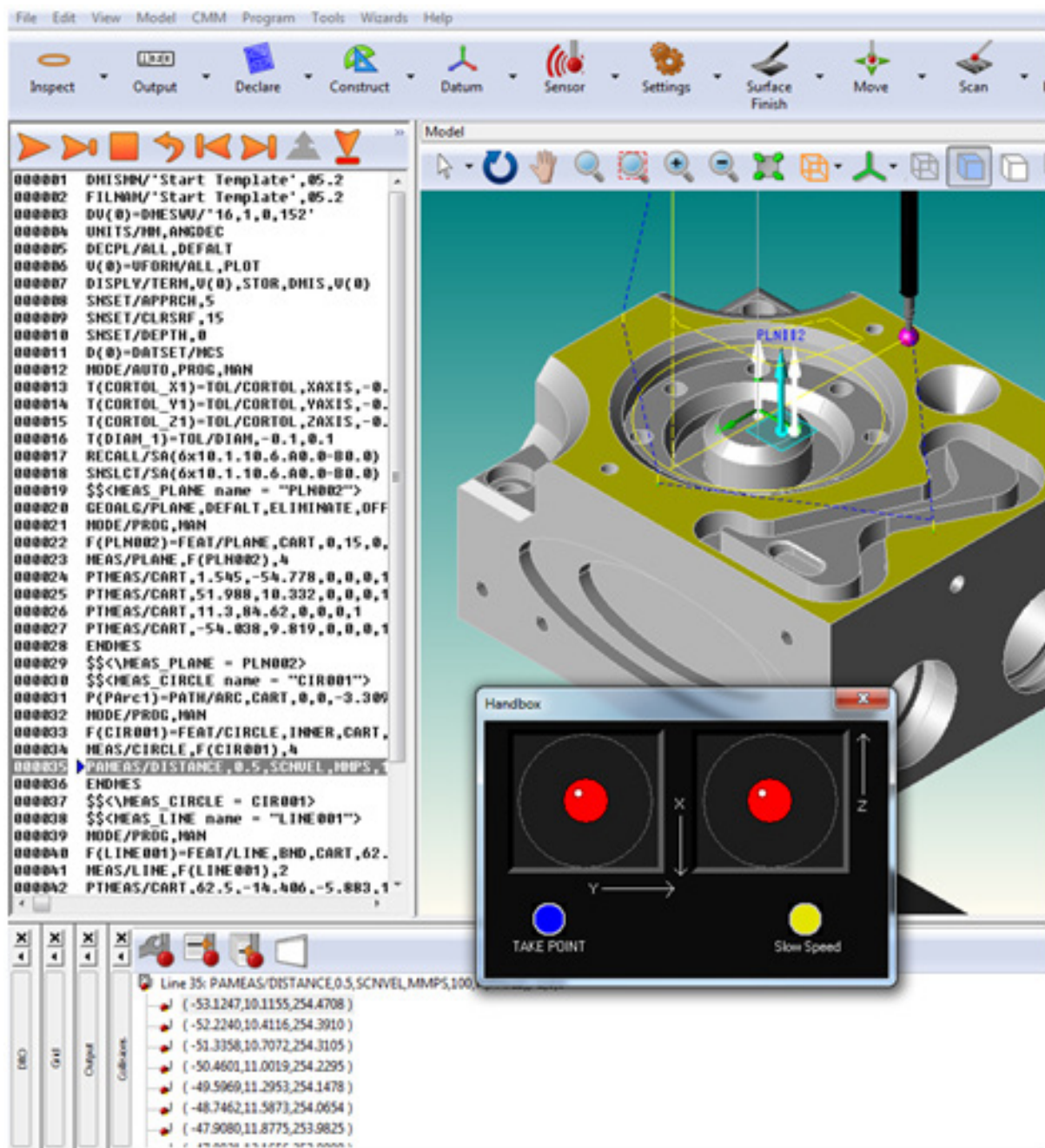


# Offline programming methods



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# Offline programming

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# **1 Offline programming**

## **1.1 Tutorial pre-requisites**

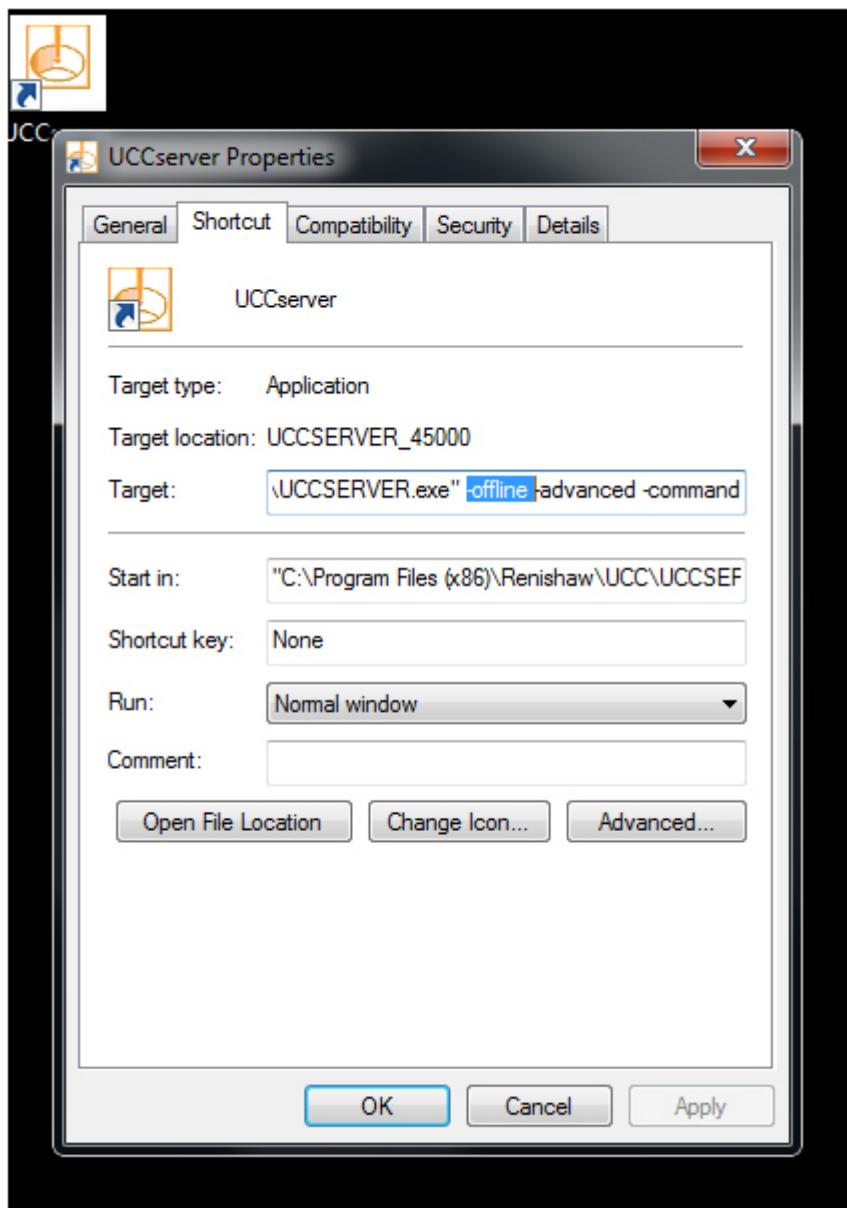
- The student should have completed the basic tutorials
- The student should have completed the 'Work cell creation' tutorial

## **1.2 Tutorial objectives**

- To introduce the student to methods of realistically simulating part measurement when the CMM is disconnected
- Further discussion of the interaction of MODUS with UCCserver
- Further exposure to model manipulation

## 2 Introduction

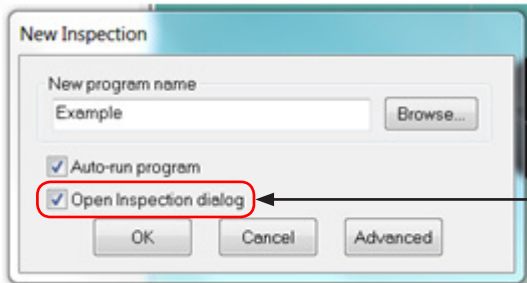
Offline programming can be performed in MODUS. If MODUS is purchased as a full online package, it can also be used to program offline. However, if MODUS is purchased as an offline package, then it cannot be used to program online. In most other ways, offline programming is exactly the same as programming online. MODUS can be set to online or offline, as can UCCserver. UCCserver runs offline by adding the tag '-offline' to the shortcut (as shown below). With UCCserver set to offline, it cannot run the CMM even if it is connected. Normally, the offline tag is only used on a system that is not connected to a CMM. UCCserver must be installed on offline systems so that created tools (probes) can be built and then imported into MODUS.



The following is an example of how to create a program offline.

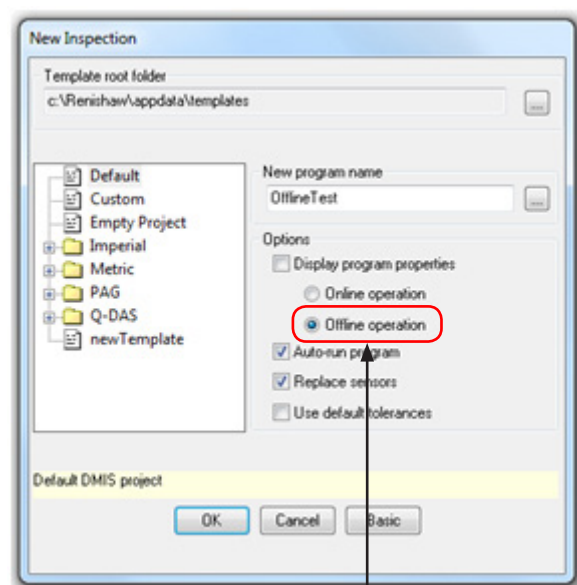
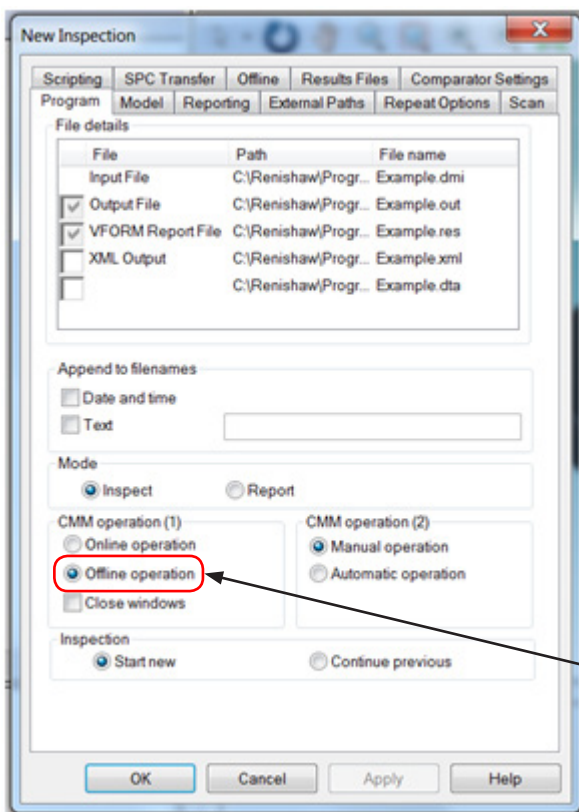
### 3 Starting an offline program

Begin by starting a new program.



Ensure that the 'Open inspection dialog' box is ticked.

Then select 'Offline' in the program tab of the new inspection window. This starts the program in offline mode.



MODUS set to offline.

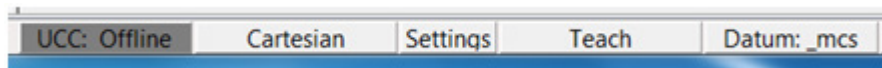
The program will open in offline mode, which means that there is no communication between MODUS and UCCserver.

**GUIDANCE NOTE:** The screenshot above shows both the default basic and advanced versions of the 'New Inspection' dialogue box.

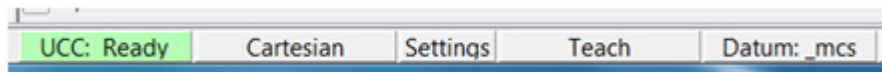


An easy way to check if the system is online or offline is to look at the bottom of the MODUS window:

**Offline:**

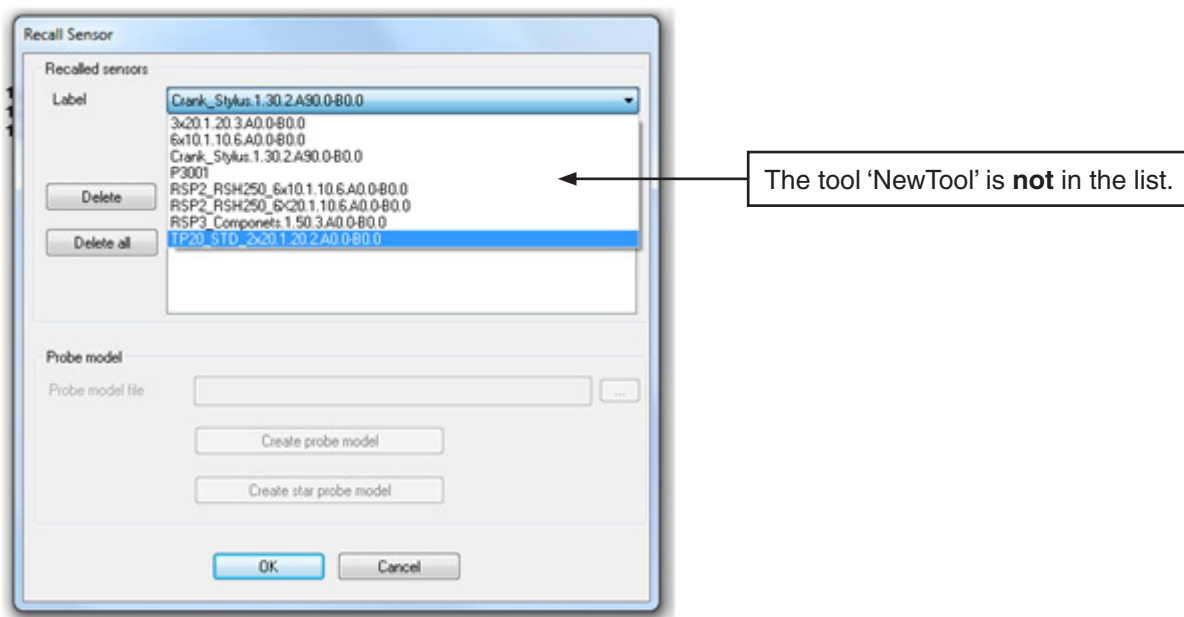
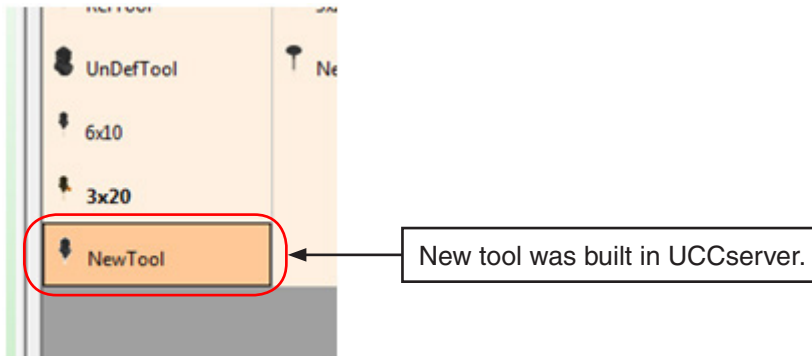


**Online:**

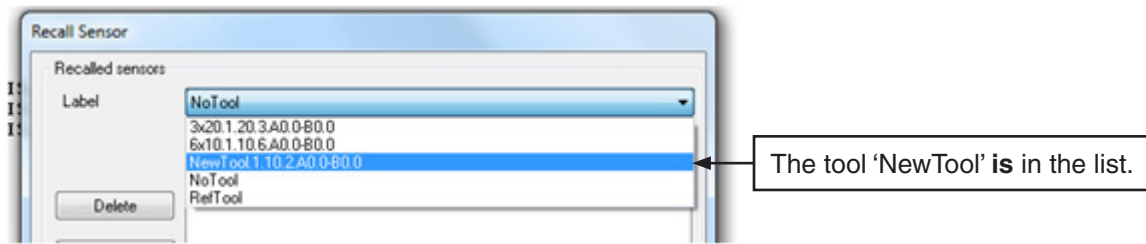


## 4 Recalling tools (probes) when offline

All tools (probes) are built in UCCserver. Once built, tools can be recalled in MODUS but this requires communication between MODUS and UCCserver. When MODUS is offline there is no communication between UCCserver and MODUS. Therefore, to initially recall tools from UCCserver into the MODUS database, MODUS must go online. This opens communications between UCCserver and MODUS and all available tools will be visible. To illustrate this, build a tool in UCCserver called 'NewTool', set MODUS to offline, and then attempt to recall the tool in MODUS.



Now set MODUS to 'Online' and again attempt to recall the Tool. The tool 'NewTool' will now be visible from the dropdown menu. The list, which over time can become very large, will show all tools available in the database. All tools recalled in this way will, in future, be available when MODUS is offline.

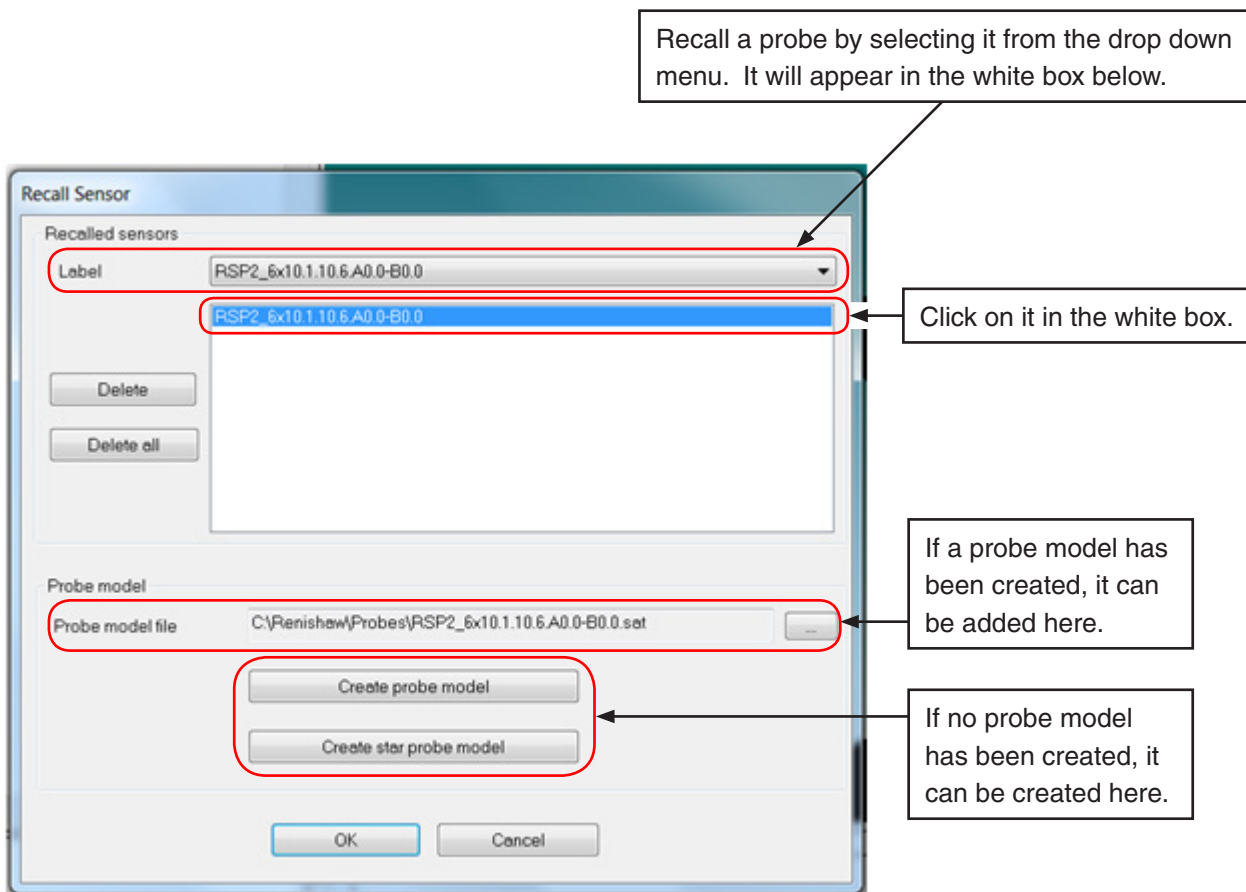


**GUIDANCE NOTE:** When first starting a new program, after recalling a probe, the centre of the probe head may be visually positioned at the centre of the CAD model coordinate system i.e. inside the CAD model. To correct this, change MODUS from offline to online and then back to offline. The probe head will now be displayed with the stylus tip at the centre of the CAD model coordinate system.

## 5 CMM probe model

A probe model can be generated in MODUS to reflect the actual probe that will be used when measuring a real part.

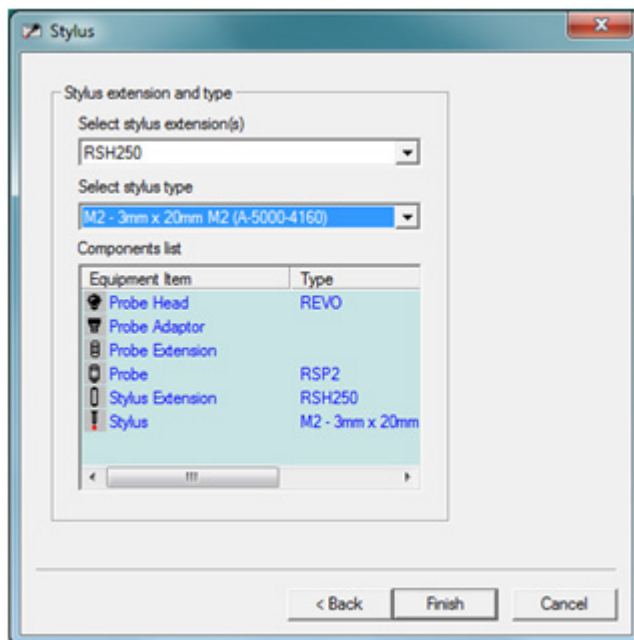
Recall a probe by selecting it from the drop down menu.



There is a very accurate probe model that UCCserver creates, but it is not used in MODUS at this time. It can only be used in UCCserver, so a new probe model must be created by the user in order to have one in MODUS. After clicking 'Create Probe Model', the MODUS 'Probe Wizard' will appear.

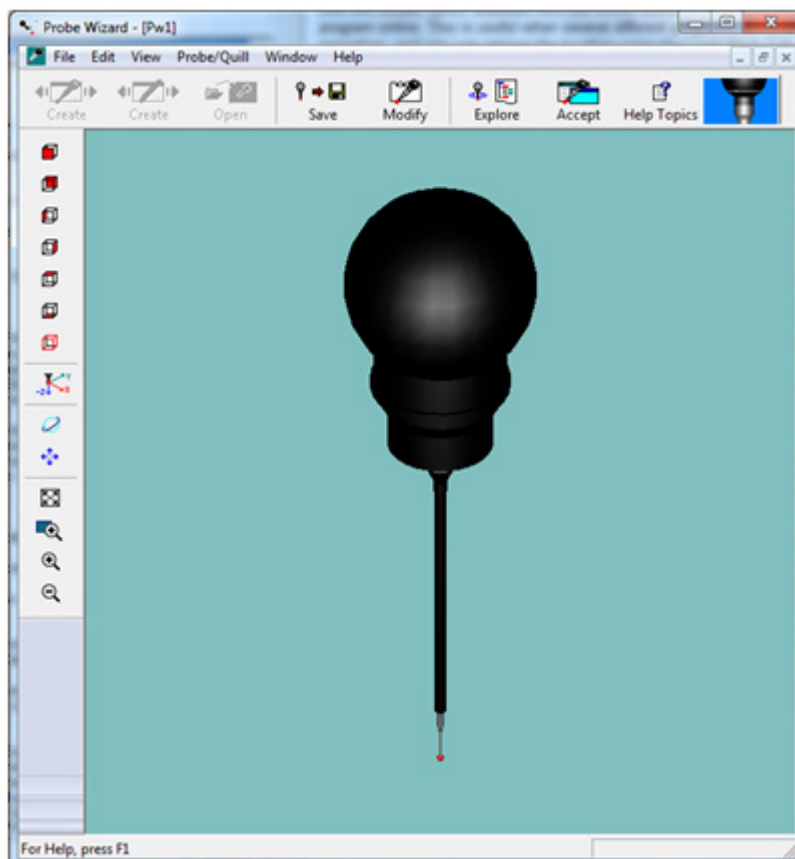
A series of drop down menus allow the components to be added to the probe. Select each component from the drop down menus. Add all relevant components to the probe model in a similar way to that used in UCCserver.

**GUIDANCE NOTE:** The purpose of the light blue COMPONENTS LIST is to display the current build, and cannot be manipulated.

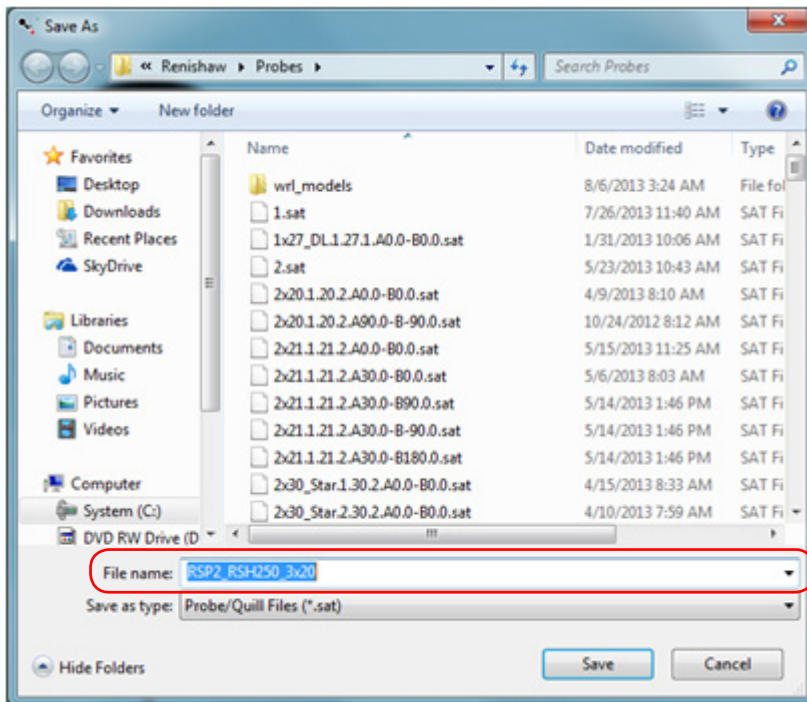


When finished, the probe model will display on the next screen.

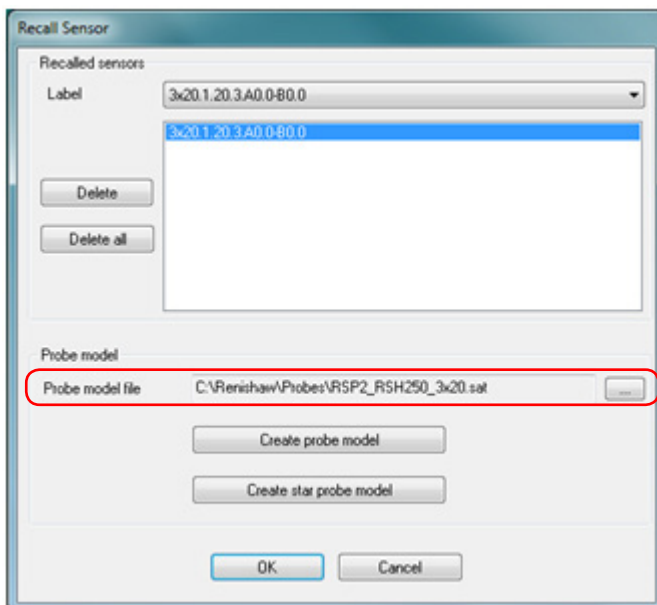
**GUIDANCE NOTE:** The top portion (head) will not appear complete and will only show a small sphere. This is normal and will be hidden inside a REVO, PH20, PH10 or other relevant head that is defined in the UCCserver environment.



Save the .sat probe model in a the following location C:/Renishaw/Probes) and give it a meaningful name.



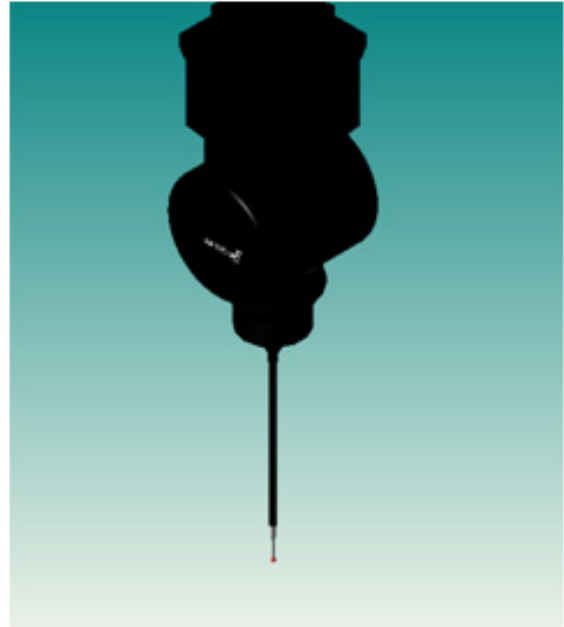
Click the 'Accept' button at the top of the 'Probe Wizard' and exit to return to the 'Recall sensor' dialogue. The path and name of the newly created probe model will appear in the 'Probe model file' text box. Note that this is the name that was saved previously.



After clicking 'OK' and leaving the 'Recall probe' dialogue, the probe model will still not load correctly in the model window. This is normal. Using the 'Restart' button at the top of the DMIS pane will also allow the probe model to load correctly.

**Default probe model:**

C:\Renishaw\Probes\3x20.1.20.3.A0.0-B0.0.sat

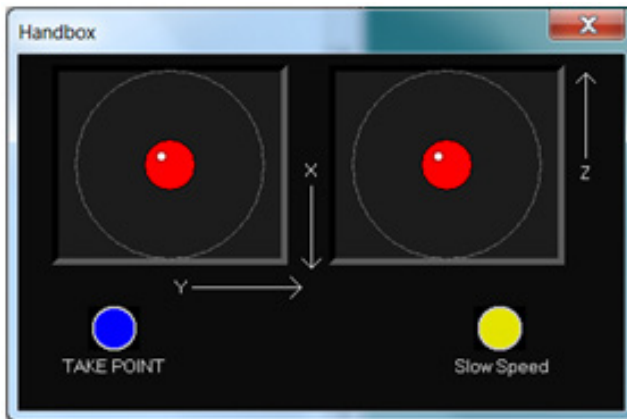
**Accurate probe model:**

C:\Renishaw\Probes\RSP2\_RSH250\_3x20.sat

## 6 Offline GOTO methods

Once an accurate probe model has been created, the hand box can be simulated to control the position of the probe model in relation to the CMM bed or CAD model.

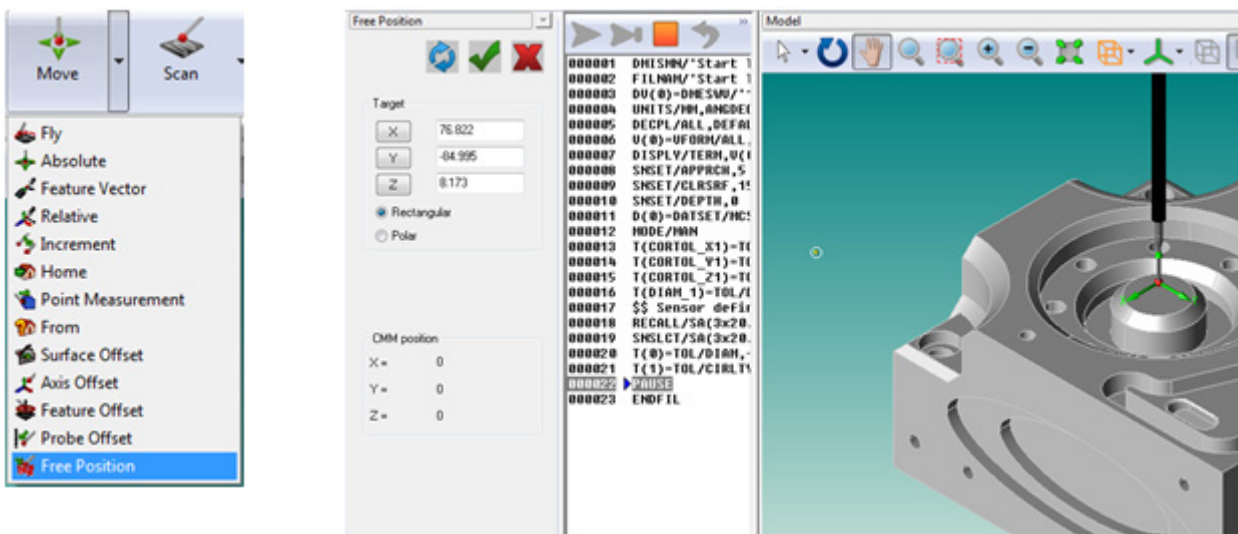
By selecting CMM from the headings at the top of the window and then selecting 'SET PROBE POSITION' it will bring up a virtual joystick.



**GUIDANCE NOTE:** This hand positioning tool shows X,Y,Z CMM convention.

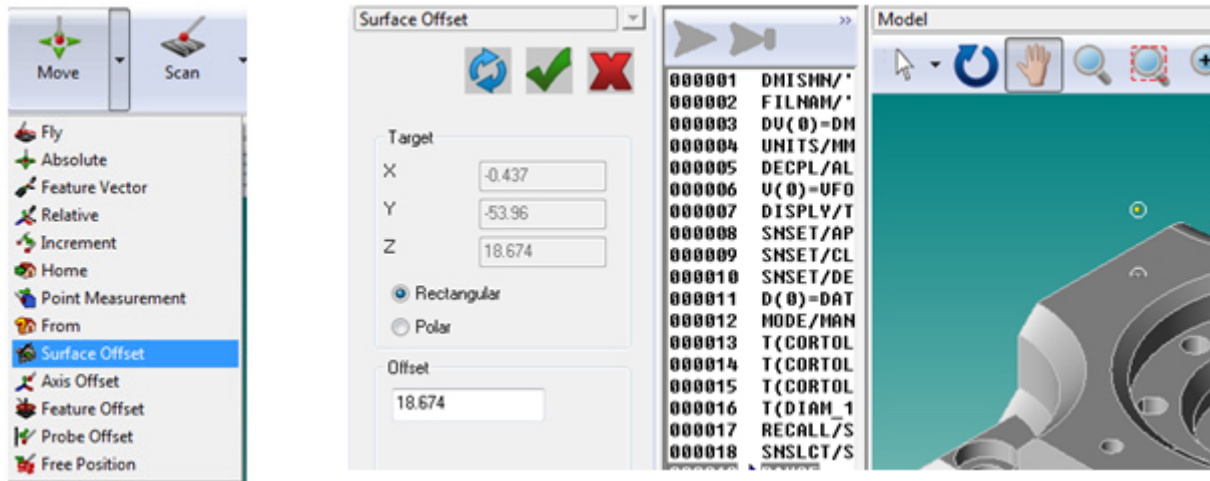
Dragging (left mouse button) the red areas of the virtual joysticks will move the model of the probe. Clicking 'TAKE POINT' adds a GOTO point to the program.

There are several other convenient methods to create GOTO points in an offline situation. One way is to click 'Move' and select 'Free Position'. Then drag the centre of the probe tip in the model window. This moves the small yellow dot to a new position and a new GOTO can easily be created.





Feature and surface offset are other offline methods. For example, select 'Surface Offset', click on a surface of the model. Then click on the yellow dot and drag it up or down, it will only move in the direction of the feature nominal. Press the 'green tick' and a GOTO is then written to the program.

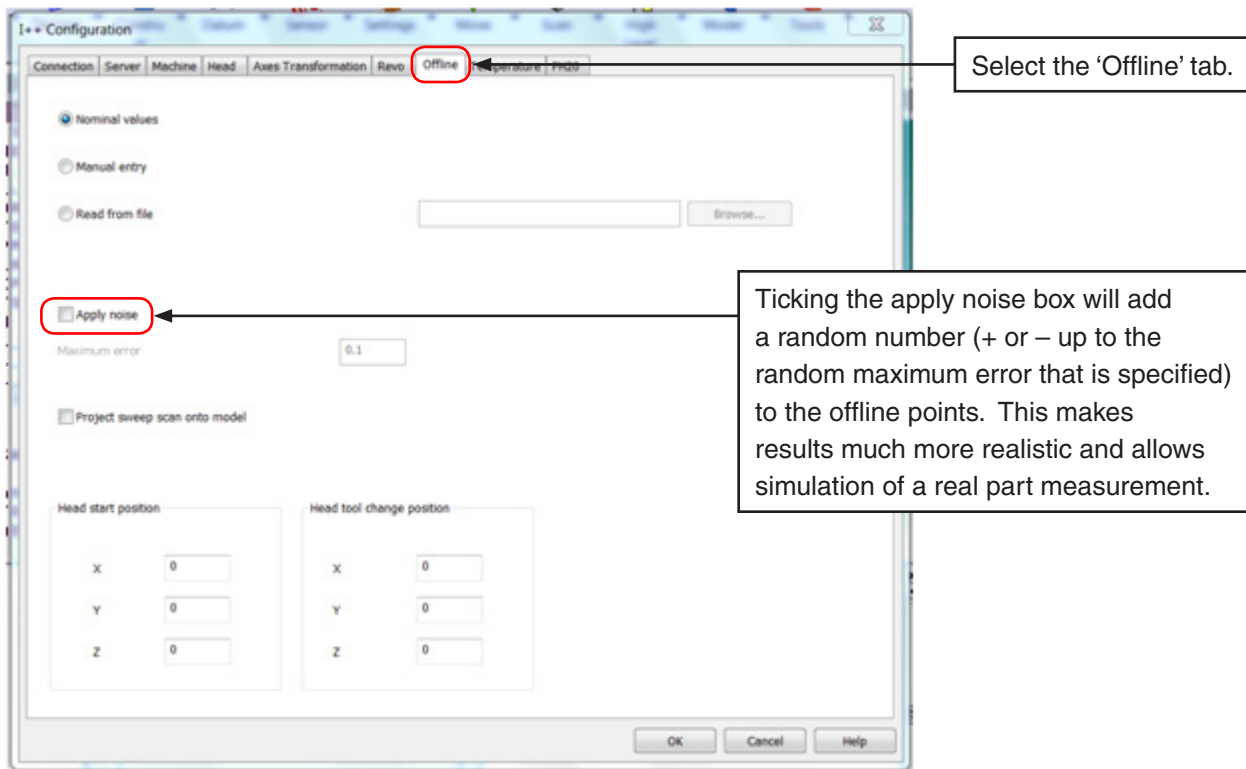


Feature offset is done in a similar way, but a feature is selected rather than a surface. To use a circle feature, click the edge of the circle and the yellow dot will appear at the centre.

## 7 Adding noise to simulated measurements

It is sometimes desirable to create random error in offline measurements. Without doing this, the data is perfect and it is difficult to simulate a real measurement situation.

Select 'CMM' and 'CONFIGURE' from the drop down menu. Then select the 'Offline' tab to give options related to offline measuring.



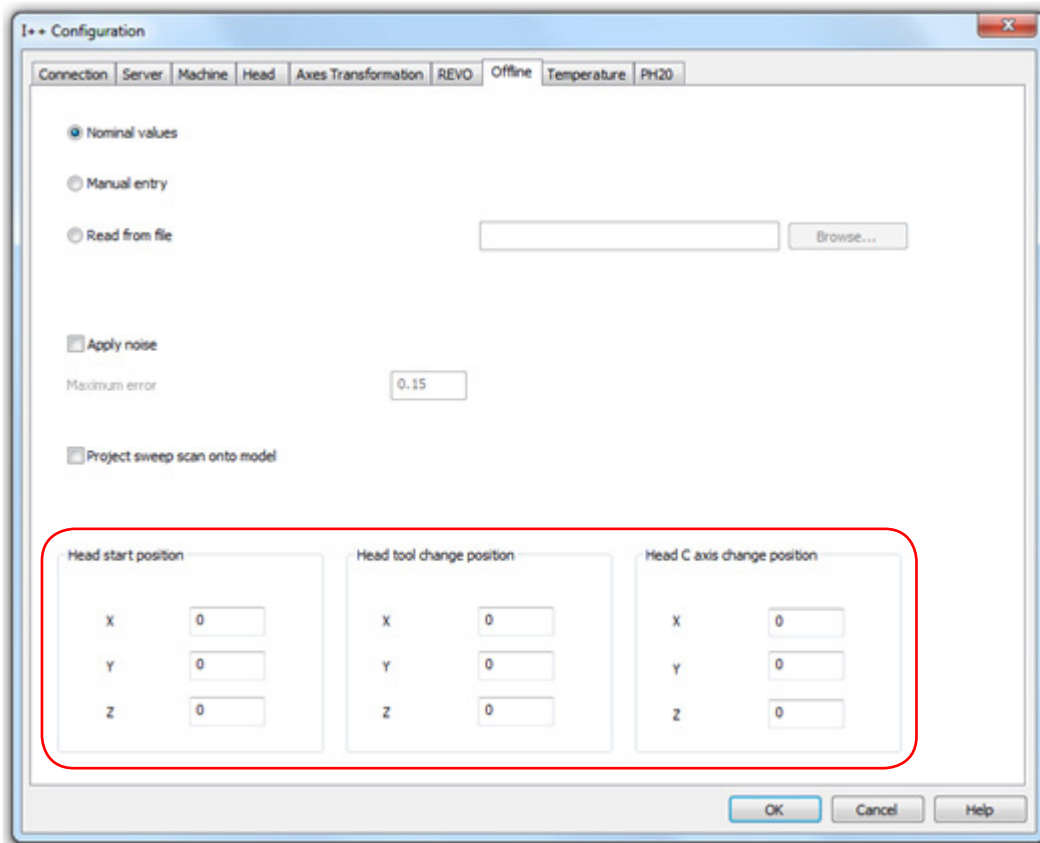
**Nominal values** - select this option to use the nominal values of all features as the actual values in all measurement modes when MODUS is offline. This makes the part program run quickly; allowing quicker debugging for syntax and logic errors.

**Manual entry** - select this option to display the 'Manual Point Entry' dialogue box when measuring features in MAN (manual) mode, with MODUS offline. This allows point data to be typed in while in manual mode. In 'PROG' and 'AUTO' (CNC) modes, the nominal values are used as the actual values.

**Read from file** - select this option to read all the data required by the part program from a file, when running the program with MODUS offline. Type the name and path of the file in the adjacent field. Use the 'Browse' button to display the 'Open' dialogue box, to browse for the points file. For details of the file format, see the help file ('Sample points file for offline simulation').

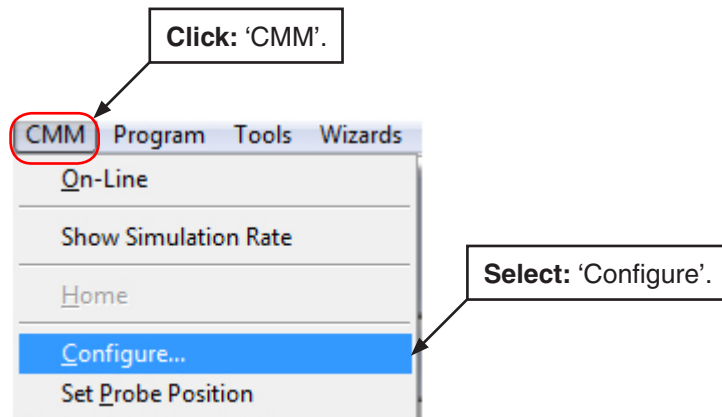
## 8 Setting the head position

The head start position, head tool change position and head C-axis change position (surface finish) can also be set. Click on 'CMM' then 'Configure', then select the 'Offline' tab and change the values to appropriate values. This can be important to move the probe away from the model so there is no offline collision during probe changes and at the beginning of a program. Collision detection will be discussed later.

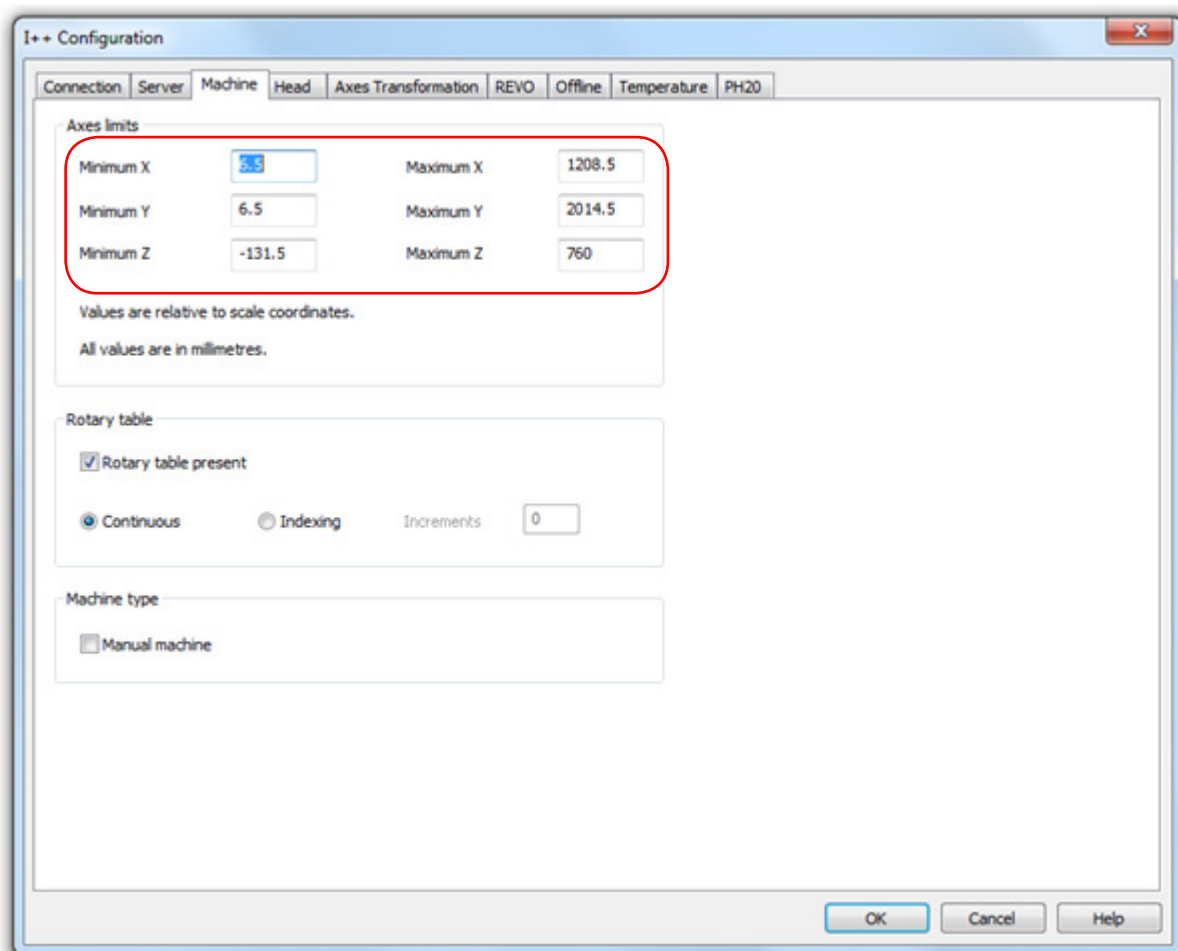


## 9 Setting the CMM limits for simulation

The limits of the CMM volume can be set in MODUS. This only sets the CMM size for simulation purposes in an offline condition, since the actual CMM limits are set in the machine INI file, referenced by the UCCserver environment.



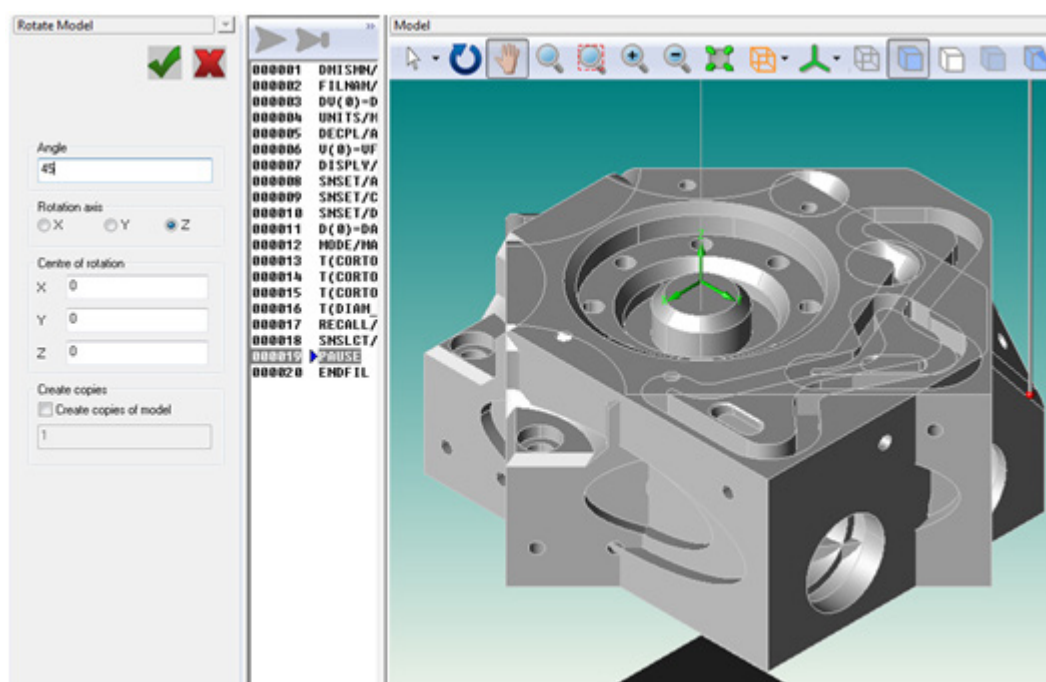
The minimum X, Y, Z and maximum X, Y and Z can be changed to duplicate the actual machine working volume in which the program will eventually run.



## 10 Model manipulation

The model can be directly rotated in the model window - this is done by rotating or translating the model, so that its model axes match the machine axes. This is the simplest method to change the way the model is orientated in the model window.

Click 'MODEL', 'ROTATE', select the rotation axis and the angle to rotate. The model will show the original and the new rotation. Once the green tick is clicked, it will only show the new position of the model. Several rotations and translations can be done if a specific model position and orientation is needed.



**GUIDANCE NOTE:** More comprehensive model manipulation techniques are detailed in the 'Model manipulation' and 'Work cell creation' tutorials.

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